IN THE CLAIMS:

Please AMEND claims 45-58, 71, 92-101, 110, 199, 121-123, and 126-131, as shown below.

1-34 (Canceled)

35. (Previously Presented) A method, comprising:

providing digital data to be transmitted to a remote station as a plurality of parallel bitstreams;

phase modulating said bitstreams with respective orthogonal or substantially orthogonal spectrum spreading signals to produce a plurality of modulating signals;

phase modulating respective instances of a carrier with said modulating signals to produce a plurality to modulated carrier instances; and

summing the modulated carrier instances and transmitting the result of said summation.

36. (Previously Presented) A method according to claim 35, further comprising:

producing each spreading signal by phase modulating a common finite spreading sequence with a respective cyclic signal, said cyclic signals being such that each completes an integer number of cycles in the duration of said spreading sequence.

37. (Previously Presented) A method according to claim 36, wherein said cyclic signals are substantially sinusoidal.

38. (Previously Presented) A method according to claim 37, wherein said cyclic signals are stepped sine waves, each step having the same duration as chips of said spreading sequence.

39. (Previously Presented) A method according to claim 35, wherein one of the spreading signals comprises a finite spreading sequence, further comprising:

producing each of the other spreading signals by phase modulating said finite spreading sequence with a respective cyclic signals, said cyclic signals being such that each completes an integer number of cycles in the duration of said spreading sequence.

40. (Previously Presented) A method according to claim 39, wherein said cyclic signals are substantially sinusoidal.

41. (Previously Presented) A method according to claim 40, wherein said cyclic signals are stepped sine waves, each step having the same duration as chips of said spreading sequence.

42. (Previously Presented) A method according to claim 35, wherein at least one of said spreading signals comprises a spreading sequence c[.] that is derived from a first code a[.] and a second code b[.] according to

$$c[n] = \left\lfloor a[0]\vec{b}, a[1]\vec{b}, \ldots, a[M-1]\vec{b} \right\rfloor.$$

43. (Previously Presented) A method according to claim 42, wherein the Fourier transforms of the first and second codes satisfy:

$s[t] \leftrightarrow S(e^{j\omega}) \neq 0$ for all ω

where s and S represent the first and second codes in the time and frequency domains respectively.

44. (Previously Presented) A method according to claim 35, wherein said bitstreams comprise bits of a single digital signal such that groups of bits of said single digital signal are transmitted in parallel.

45. (Currently Amended) ~~A transmitter~~An apparatus, comprising:

a source of digital data to be transmitted to a remote station as a plurality of parallel bitstreams;

a first phase ~~modulating unit~~modulator configured to phase modulate said bitstreams with respective orthogonal or substantially orthogonal spectrum spreading signals to produce a plurality of modulating signals;

a second phase ~~modulating unit~~modulator configured to phase modulate respective instances of a carrier with said modulating signals to produce a plurality to modulated carrier instances; and

a summer configured to sum the modulated carrier instances.

46. (Currently Amended) ~~A transmitter according to~~The apparatus of claim 45, wherein the first phase ~~modulating unit~~modulator comprises a spreading signal ~~production unit~~source configured to produce each spreading signal by phase modulating a common finite spreading sequence with a respective cyclic signal, said cyclic signals being such that each completes an integer number of cycles in the duration of said spreading sequence.

47. (Currently Amended) ~~A transmitter according to~~The apparatus of claim 46, wherein said cyclic signals are substantially sinusoidal.

48. (Currently Amended) ~~A transmitter according to~~The apparatus of claim 47, wherein said cyclic signals are stepped sine waves, each step having the same duration as chips of said spreading sequence.

49. (Currently Amended) ~~A transmitter according to~~The apparatus of claim 45, wherein the first phase ~~modulating unit~~modulator comprises a spreading signal ~~production unit~~source configured to produce one of the spreading signals by generating a finite spreading sequence and to produce the other spreading signals by phase modulating said finite spreading sequence with a respective cyclic signal, said cyclic signals being such that each completes an integer number of cycles in the duration of said spreading sequence.

50. (Currently Amended) ~~A transmitter according to~~The apparatus of claim 49, wherein said cyclic signals are substantially sinusoidal.

51. (Currently Amended) ~~A transmitter according to~~The apparatus of claim 50, wherein said cyclic signals are stepped since waves, each step having the same duration as chips of said spreading sequence.

52. (Currently Amended) ~~A transmitter according to~~The apparatus of claim 45, wherein at least one of said spreading signals comprises a spreading sequence c[.] that is derived from a first code a[.] and a second code b[.] according to

$$c[n] = \lfloor a[0]\vec{b}, a[1]\vec{b}, \ldots, a[M-1]\vec{b} \rfloor.$$

53. (Currently Amended) ~~A transmitter according to~~The apparatus of claim 52, wherein the Fourier transforms of the first and second codes satisfy

$s[t] \leftrightarrow S(e^{j\omega}) \neq 0$ for all ω

where s and S represent the first and second codes in the time and frequency domains respectively.

54. (Currently Amended) ~~A transmitter according to~~The apparatus of claim 45, wherein the source of digital data signals includes a ~~generation unit~~generator configured to generate said bitstreams from a single digital signal such that groups of bits of said single digital signal are transmitted in parallel.

55. (Currently Amended) ~~A transmitter according to~~The apparatus of claim 54, wherein said ~~generation unit~~generator comprises a digital signal processor.

56. (Currently Amended) ~~A transmitter according to~~The apparatus of claim 45, wherein the first phase ~~modulating unit~~modulator comprises a digital signal processor.

57. (Currently Amended) ~~A transmitter according to~~The apparatus of claim 45, wherein the second phase ~~modulating unit~~modulator comprises a plurality of analog phase modulators.

58. (Currently Amended) A mobile phone including the ~~transmitter~~ apparatus of claim 45.

59-70 (Cancelled)

71. (Currently Amended) A base station of a mobile phone network including the ~~transmitter~~ apparatus of claim 45.

72-83 (Cancelled)

84. (Previously Presented) A method of receiving a signal produced by a method according to claim 35, the method comprising:

producing a baseband signal, comprising components corresponding to the modulating signals, from a received radio frequency signal; and

processing the baseband signal by processes configured to extract the data from each of the modulating signals.

85. (Previously Presented) A method according to claim 84, further comprising:

combining data bits extracted by said processes into a single data signal.

86. (Previously Presented) A method according to claim 84, further comprising:

mapping the outputs of said processes onto a transmitted parallel bit pattern using a maximum likelihood algorithm; and

outputting said parallel bit pattern.

87. (Previously Presented) A method according to claim 86, further comprising:

combining data bits extracted by said processes into a single data signal.

88. (Previously Presented) A method according to claim 84, wherein at least all but one of said processes comprises:

phase modulating the baseband signal by the inverse of a respective one of said cyclic signal to produce a first signal;

phase modulating instances of the first signal by respective cyclic signals of the form $e^{j2\pi nP/L}$ where P comprises the set of values in the range 0, ...,L-1, and L is the length of the second code to produce L second signals;

filtering each of said second signals with a filter having a transfer function that is the inverse of the first code to produce respective third signals;

correlating the third signals with corresponding reference signals; and

summing the results of the correlations.

89. (Previously Presented) A method according to claim 88, further comprising:

combining data bits extracted by said processes into a single data signal.

90. (Previously Presented) A method according to claim 88, further comprising:

mapping the outputs of said processes onto a transmitted parallel bit pattern using a maximum likelihood algorithm; and

outputting said parallel bit pattern.

91. (Previously Presented) A method according to claim 90, further comprising:

combining data bits extracted by said processes into a single data signal.

92. (Currently Amended) An apparatus, comprising:

a receiver ~~for receiving~~ configured to receive a signal produced by a method comprising providing digital data to be transmitted to a remote station as a plurality of parallel bitstreams, phase modulating said bitstreams with respective orthogonal or substantially orthogonal spectrum spreading signals to produce a plurality of modulating signals, phase modulating respective instances of a carrier with said modulating signals to produce a plurality to modulated carrier instances, and summing the modulated carrier instances and transmitting the result of said summation, the receiver comprising~~:~~

a radio frequency ~~processing unit~~processor configured to produce a baseband signal, comprising components corresponding to the modulating signals, from a received radio frequency signal; and

a ~~processing unit~~processor configured to process the baseband signal by processes configured to extract the data from each of the modulating signals.

93. (Currently Amended) ~~A receiver according to~~The apparatus of claim 92, wherein the ~~processing unit~~processor is configured to combine the extracted data bits into a single data signal.

94. (Currently Amended) ~~A receiver according to~~The apparatus of claim 92, wherein the ~~processing unit~~processor is configured to map the outputs of said processes

onto a transmitted parallel bit pattern using a maximum likelihood algorithm and to output said parallel bit pattern.

95. (Currently Amended) ~~A receiver according to~~The apparatus of claim 94, wherein the ~~processing unit~~processor is configured to combine the extracted data bits into a single data signal.

96. (Currently Amended) ~~A receiver according to~~The apparatus of claim 92, wherein at least all but one of said processes comprises:

phase modulating the baseband signal by the inverse of a respective one of said cyclic signal to produce a first signal;

phase modulating instances of the first signal by respective cyclic signals of the form $e^{j2\pi nP/L}$ where P comprises the set of values in the range 0, ..., L-1, and L is the length of the second code to produce L second signals;

filtering each of said second signals with a filter having a transfer function that is the inverse of the first code to produce respective third signals; and

correlating the third signals with corresponding reference signals and summing the results of the correlations.

97. (Currently Amended) ~~A receiver according to~~The apparatus of claim 96, wherein the ~~processing unit~~processor is configured to combine the extracted data bits into a single data signal.

98. (Currently Amended) ~~A receiver according to~~The apparatus of claim 96, wherein the ~~processing unit~~processor is configured to map the outputs of said processes onto a transmitted parallel bit pattern using a maximum likelihood algorithm and to output said parallel bit pattern.

99. (Currently Amended) ~~A receiver according to~~The apparatus of claim 98, wherein the ~~processing unit~~processor is configured to combine the extracted data bits into a single data signal.

100. (Currently Amended) ~~A receiver according to~~The apparatus of claim 92, wherein the ~~processing unit~~processor comprises a digital signal processor.

101. (Currently Amended) A mobile phone including the ~~receiver~~ apparatus of claim 92.

102-109 (Cancelled)

110. (Currently Amended) A base station of a mobile phone network including the ~~receiver~~ apparatus of claim 92.

111-118 (Cancelled)

119. (Currently Amended) A ~~mobile phone~~ network, ~~including~~ comprising:

a plurality of mobile phones; and

a base station in communicative relation to ~~a~~ the plurality of mobile phones, the base station including a receiver comprising:

a radio frequency ~~processing unit~~processor configured to produce a baseband signals, comprising components corresponding to the modulating signals, from a received radio frequency signal, and

a ~~processing unit~~processor configured to process the baseband signal by processes configured to extract the data from each of the modulating signals; and each mobile phone including a transmitter comprising:

a source of digital data to be transmitted to a remote station as a plurality of parallel bitstreams;

a first phase ~~modulating unit~~modulator configured to phase modulate said bitstreams with respective orthogonal or substantially orthogonal spectrum spreading signals to produce a plurality of modulating signals;

a second phase ~~modulating unit~~modulator configured to phase modulate respective instances of a carrier with said modulating signals to produce a plurality to modulated carrier instances; and

a summer configured to sum the modulated carrier instances; wherein the mobile phones employ the same carrier frequency and spreading signals for communication with the base station, each mobile phone applying the spreading signals in a time offset manner relative to the use of the spreading signals by each of the other mobile phones.

120. (Withdrawn) A method of RS-CTDMA operation in which, for a spreading code of length N=ML,

(a) L orthogonal codes, specified by $\{f_i\} = \{i + \ell * M\}$ $(\ell = 0, \cdots L-1)$ for $i \in [0, M-1]$, are used to transmit up to L data bits parallel for a user in the ith cell;

(b) Users within one cell are time-offset by at least L chips to avoid or reduce intracell interuser interference; and

(c) M orthogonal spectral groups are used in difference cells.

121. (Currently Amended) A ~~transmitter~~n apparatus, comprising:

digital data source means for providing digital data to be transmitted to a remote station as a plurality of parallel bitstreams;

first means for phase modulating said bitstreams with respective orthogonal or substantially orthogonal spectrum spreading signals to produce a plurality of modulating signals;

second means for phase modulating respective instances of a carrier with said modulating signals to produce a plurality to modulated carrier instances; and

summing means for summing the modulated carrier instances.

122. (Currently Amended) A<u>n apparatus, comprising:</u>

~~receiver~~ <u>receiving means</u> for receiving a signal produced by a method comprising providing digital data to be transmitted to a remote station as a plurality of parallel bitstreams, phase modulating said bitstreams with respective orthogonal or substantially orthogonal spectrum spreading signals to produce a plurality of modulating signals, phase modulating respective instances of a carrier with said modulating signals to produce a plurality to modulated carrier instances, and summing the modulated carrier instances and transmitting the result of said summation, the receiver <u>means</u> comprising~~:~~

radio frequency processing means for producing a baseband signal, comprising components corresponding to the modulating signals, from a received radio frequency signal; and

processing means for processing the baseband signal by processes configured to extract the data from each of the modulating signals.

123. (Currently Amended) A ~~mobile phone~~ network, ~~including~~ comprising:

a plurality of mobile phones; and

a base station in communicative relation to ~~a~~ the plurality of mobile phones, the base station including a receiver comprising:

radio frequency processing means for producing a baseband signals, comprising components corresponding to the modulating signals, from a received radio frequency signal, and

processing means for processing the baseband signal by processes configured to extract the data from each of the modulating signals; and each mobile phone including a transmitter comprising:

digital data source means for providing digital data to be transmitted to a remote station as a plurality of parallel bitstreams;

first means for phase modulating said bitstreams with respective orthogonal or substantially orthogonal spectrum spreading signals to produce a plurality of modulating signals;

second means for phase modulating respective instances of a carrier with said modulating signals to produce a plurality to modulated carrier instances; and

summing means for summing the modulated carrier instances; wherein the mobile phones employ the same carrier frequency and spreading signals for communication with the base station, each mobile phone applying the spreading signals in a time offset manner relative to the use of the spreading signals by each of the other mobile phones.

124. (Previously Presented) The method of claim 35, wherein the spreading signals comprise a common finite spreading sequence.

125. (Previously Presented) The method of claim 84, wherein the spreading signals comprise a common finite spreading sequence.

126. (Currently Amended) The ~~transmitter~~ apparatus of claim 45, wherein the spreading signals comprise a common finite spreading sequence.

127. (Currently Amended) The ~~transmitter~~ apparatus of claim 121, wherein the spreading signals comprise a common finite spreading sequence.

128. (Currently Amended) The ~~receiver~~ apparatus of claim 92, wherein the spreading signals comprise a common finite spreading sequence.

129. (Currently Amended) The ~~receiver~~ apparatus of claim 122, wherein the spreading signals comprise a common finite spreading sequence.

130. (Currently Amended) The ~~mobile phone~~ network of claim 119, wherein the spreading signals comprise a common finite spreading sequence.

131. (Currently Amended) The ~~mobile phone~~ network of claim 123, wherein the spreading signals comprise a common finite spreading sequence.